

Modules and Software for Free-Flying Robots, Phase I

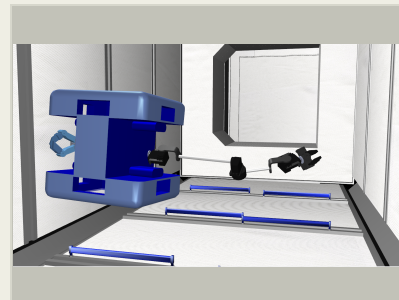
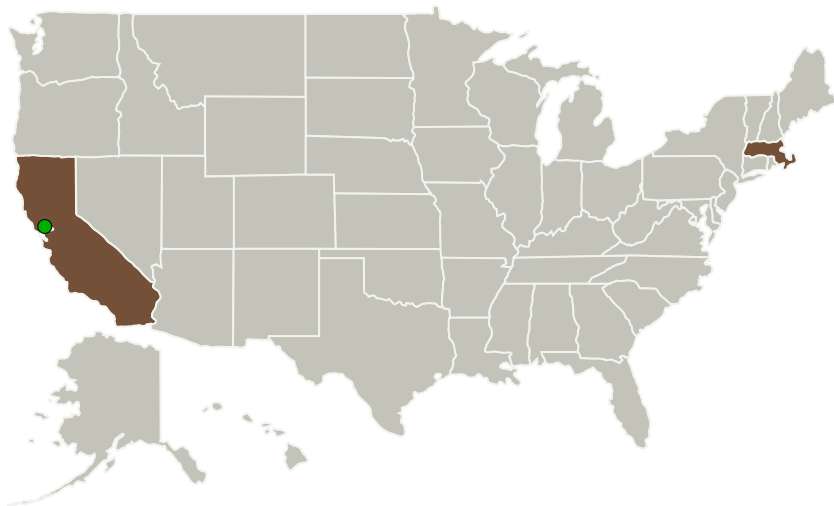
Completed Technology Project (2017 - 2017)



Project Introduction

Energid Technologies will develop actuator and gripper modules with control and simulation software for building mechanisms to attach to free-flying robots. The technology leverages Energid's existing hardware and software to reduce weight and improve performance. The approach enables novel modes of maneuvering, controlling, and sensing. The module infrastructure includes simulated sensors that enable precise control of mechanisms built with the modules to serve to support a variety of other applications. Multiple articulated mechanisms may be attached to one free-flying robot and cooperatively operated, for example. To control the arms and base, Energid's Actin software toolkit will be extended and applied to enable use of articulated mechanisms in perching and acrobatic modes, with one end-effector fixed in perching mode and momentum conservation integral to the control during acrobatic mode. Included will be powerful simulation software that, by leveraging Energid's commercial Actin software, will be cross platform, fast, and feature rich. The simulation, modeling many aspects of the free-flying robot, will support design validation efforts as well as mission planning and testing. It will seamlessly transition between simulating terrestrial test beds and fielded free-flying robots in a microgravity environment. The simulation will include articulated dynamics, contact dynamics, sensors, and the aerodynamics of any mechanism built with the modules.

Primary U.S. Work Locations and Key Partners



Modules and Software for Free-Flying Robots, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Energid Technologies	Lead Organization	Industry	Cambridge, Massachusetts
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

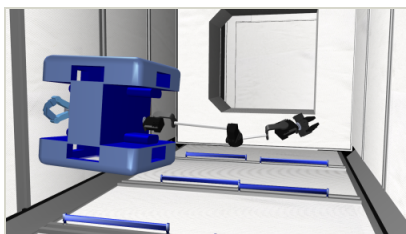
Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

**June 2017:** Project Start**December 2017:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140818>)

Images

**Briefing Chart Image**

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(<https://techport.nasa.gov/image/130120>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Energid Technologies

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

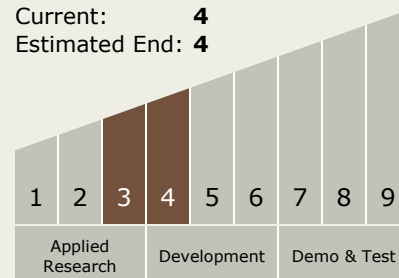
Douglas E Barker

Technology Maturity (TRL)

Start: **3**

Current: **4**

Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.3 Manipulation
 - └ TX04.3.2 Grappling Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System